



Math Mole

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Puzzles:

One: By Fermat's Little Theorem the number $x = (2^{p-1} - 1)/p$ is always an integer if p is an odd prime. For what values of p is x a perfect square?

Two: Find all pairs of positive integers x and y such that $x^2 + 3y$ and $y^2 + 3x$ are both perfect squares.

Mathematician of the Day



Pierre de Fermat (1601-1665)

- is most noted for his last theorem: $x^n + y^n = z^n$ has no positive integer solutions when $n > 2$.
- is considered to be the mathematical rival of Rene' Descartes during the time period.
- worked with Pascal to found the theory of probability after Pascal learned of Fermat's reputation as a math "wiz" of the time.
- Wrote, "I have discovered a truly remarkable proof which this margin is too small to contain," in the margin of Diaphantus's Arithmetica. (Concerning his last theorem)
- is described as a secretive and original thinker by Mahoney who wrote his book concerning Fermat's career. Fermat was very reluctant to indulge others in his thought processes.
- Due to this secrecy, most of Fermat's work was not published before his death.

Reading Assignment:

For Monday read Sections 2.2 and 3.1 (if you have time read more of Chapter 3)

Mathematics Career: Astronomer

Job Description: How old are the oldest stars? How did the first galaxies form in the universe? Why is most of the mass in the universe not directly observable? What is the nature of this "dark matter?" Will the universe expand forever? Astronomers use powerful Supercomputers to, among other things, model cosmic jets and the environment around pulsars and black holes, simulate galaxy collisions, and devise better theories on how galaxies clustered into large-scale structures in the early universe. Astronomers fall into two general categories. Observational astronomers study the stars and galaxies using equipment such as radio, optical, and X-ray telescopes, spectrographs, and satellite-mounted television cameras with computer-controlled image intensifiers. Theoretical astronomers work on developing theories from observations they make themselves or from those made by other astronomers. They develop mathematical equations derived from the laws of physics, and apply these equations to observations. They may calculate the composition of stars, galaxies, planets and formulate ideas on how they developed and how they will die. Theoretical astronomers rely heavily on computers to solve intricate equations.

Educational Requirements: A bachelor's degree is the minimum formal educational degree required for this occupation. Astronomy bachelor's or master's degree holders often enter a field unrelated to astronomy. Others may work in planetariums running science shows, assist astronomers doing research, or operate space-based and ground-based telescopes and other astronomical instrumentation. Generally, students who take mathematics or science courses after the tenth grade have the best chance of successfully pursuing a science career. Although most colleges require at least one year of high school science and two years of high school mathematics, this minimum background is insufficient for students planning to major in science. A better approach is to complete math through pre-calculus in high school. This gives students who plan to major in astronomy or physics the necessary grounding in mathematics needed to start their science courses as soon as they begin college. Both chemistry and physics courses are also strongly recommended in high school as adequate preparation for the first year of college. Many entering students have taken advanced placement calculus and/or physics, though these courses are not required. Students are also encouraged to get involved in high school science groups, state junior academies of science, and local amateur astronomy clubs. For more information visit [A New Universe to Explore: Careers in Astronomy](#) online.

Outlook: Astronomy is a relatively small field with approximately 6,000 professional astronomers in North America. Employment of physicists and astronomers is expected to grow more slowly than the average for all occupations through 2012. Federal research expenditures are the major source of astronomy-related research funds.

Information from http://tcids.tbr.edu/career_query.php?number=704